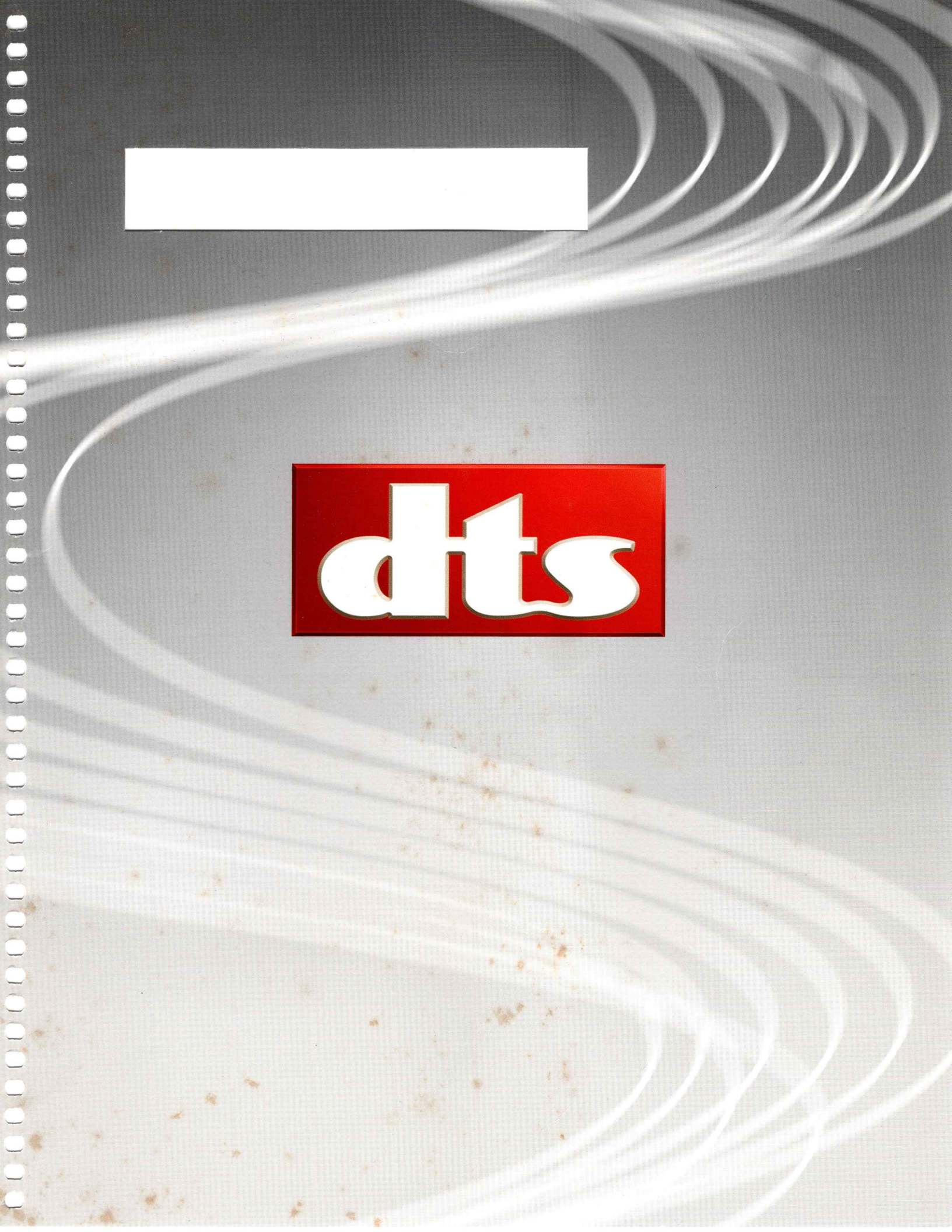
dts

DTS CAD-5 DECODER SYSTEM

VERSION 1.0 JULY 2004 #9301CAD5001.0

Installation and Operating Guide

EFFECTIVE JULY 2004

DIGITAL THEATER SYSTEMS, INC.
CINEMA PRODUCTS DIVISION
5171 CLARETON DRIVE, AGOURA HILLS, CA 91301 USA

Confidential

Contains confidential proprietary information owned by Digital Theater Systems, Inc., including but not limited to trade secrets, know-how, technical and business information. Not for disclosure except under terms of a Non-Disclosure Agreement accepted by recipient and by an actually authorized agent of Digital Theater Systems, Inc. Unauthorized disclosure is a violation of State, Federal, and International laws.

NOT FOR USE EXCEPT UNDER TERMS OF A VALIDLY EXECUTED WRITTEN LICENSE AGREEMENT BETWEEN INTENDED USER AND DIGITAL THEATER SYSTEMS, INC.

THE SOFTWARE AND METHODS ASSOCIATED WITH THIS DOCUMENT INCLUDES PATENTED ALGORITHMS, PROTECTED BY ONE OR MORE OF THE FOLLOWING PATENTS: US PATENTS NOS. 6,487,535; 5,451,942; 5,956,674; 5,974,380; 5,978,762; 6,226,616 B1; AND OTHER INTERNATIONAL PATENTS BOTH PENDING AND ISSUED.

Copyright Info

DTS CAD-5 Decoder System Manual

Do Not Duplicate. Copyright © 2004 Digital Theater Systems, Inc. Unauthorized duplication is a violation of State, Federal, and International laws.

This publication is copyrighted and all rights are reserved by Digital Theater Systems, Inc. No part of this publication may be reproduced, photocopied, stored on a retrieval system, translated, or transmitted in any form or by any means, electronic or otherwise, without the express prior written permission of Digital Theater Systems, Inc.

The content of this publication is subject to change without notice and does not represent a commitment on the part of Digital Theater Systems, Inc. Every effort has been made to ensure the accuracy of this publication. However, due to ongoing improvements and revisions, Digital Theater Systems, Inc. cannot guarantee the accuracy of printed material after date of publication nor can it accept responsibility for errors or omissions. Digital Theater Systems, Inc. will publish updates and revisions to this publication as needed.

DTS and the DTS Digital Surround logo are trademarks of Digital Theater Systems, Inc.
Neo:6 is a trademark of Digital Theater Systems, Inc.

Document No. 9301CAD5001.0
July 2004

Contents

Regulatory Notices v
Patents v
Unpacking v
Warranty Information v
DTS Offices and Technical Support vi
Returning Units for Service vi

1. INTRODUCTION 1

1.1. Front Panel Controls and Indicators 1
1.1.1. Navigation 1
1.1.2. Solo Button 1
1.1.3. Neo:6 Button 3
1.1.4. Lock / Unlock the Front Panel 3
1.2. Rear Panel Connectors 3
1.3. Functional Overview 4
1.3.1. Neo:6 Expanding Stereo into 6.0 5
1.4. Inputs 5
1.5. Outputs 5
1.6. Control 6
1.7. Additional Features 6

2. CAD-5 MENUS 7

2.1. Status Display 7
2.2. Top Level Menu Structure 8
2.3. System Setup Menus 9
2.4. Decode Parameters Menus 10
2.5. Parameters and Definitions 11
2.5.1. Analog Drive Level 11
2.5.2. Input Select 11
2.5.3. Meter Ballistics 11
2.5.4. Aux Channel Configuration 11
2.5.5. Test Tones 11
2.5.6. Output Trim Navigation 12
2.5.7. AES/EBU Configuration 12
2.5.8. IP Configuration Menu 12
2.5.9. Reset to Factory Defaults 12
2.5.10. Neo:6 Menu Parameters 14
2.5.11. 96/24 Mode 14
2.5.12. ES Mode 14

3. SAMPLE PRODUCTION SETUP 15

3.1. PCM Setup 15

4. MAINTENANCE 16

5. SPECIFICATIONS 16

5.1. Inputs 16
5.2. Outputs 16
5.3. Comm I/O 16
5.4. Metering 17
5.5. Front Display 17
5.6. Power and Dimensions 18

5.7. Environmental 18
5.8. Regulatory Compliance 18
5.9. Channel Mapping 19
WARRANTY (FORM) 21

Regulatory Notices

EMI Notice

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Canadian Department of Communications compliance statement:

This equipment does not exceed Class A limits per radio noise emissions for digital apparatus set in the Radio Interference Regulation of the Canadian Department of Communications. Operation in a residential area may cause unacceptable interference to radio and TV reception, requiring the owner or operator to take whatever steps are necessary to correct the interference.

"Avis de conformité aux normes du ministère des Communications du Canada:

Cet équipement ne depasse pas les limites de Classe A d'emission de bruits radioélectriques pour les appareils numériques telles que perscrites par le règlement sur le brouillage radioélectrique établi par le ministère des Communications du Canada. L'exploitation faite en milieu résidentiel peut entrainer le brouillage des réceptions radio et télévision, ce qui obligerait le propriétaire ou l'opérateur à prendre les dispositions nécessaires pour en éliminer les causes."

Patents

The DTS system has been granted the following patents:

US Pat. Nos. 5,451,942, 5,956,674, 5,974,380, 5,978,762 and other worldwide patents issued and pending. "DTS" and "DTS Digital Surround" are registered trademarks of Digital Theater Systems, Inc., Copyright 2000, 2001, 2002 Digital Theater Systems, Inc. All rights reserved.

Unpacking

The packaging is designed for typical shipping and handling. Upon receipt of shipment, check for signs of damage before opening and report all damage to the carrier. All shipments made from DTS are the customer's responsibility once they leave our premises.

Before installation it is suggested that a complete inventory be taken to minimize problems or questions during installation. Additionally, save all packing material until installation is complete in the unlikely event that a component(s) requires return to the factory. Use the packing slip that came with your unit to verify received inventory.

The following is a sample packing list for a single system.

DTS Pro Audio Equipment Package consists of:

- CAD-5 Decoder
- CAD-5 Decoder System Manual (this manual)
- Audio Music Sampler V.2 (DVD-A)

Warranty Information

Please complete and submit the Warranty form on page 21 within 30 days of purchase.

Equipment manufactured by DTS, Inc. is warranted against defects in materials and workmanship for one year from date of purchase. There are no other expressed or implied warranties.

DTS, Inc. obligation is restricted to repair and/or replacement of defective parts. Under no circumstances will DTS, Inc. be liable for any other damage, either direct or consequential.

All requests for repairs or information should include the unit serial number to ensure rapid service.

DTS Offices and Technical Support

DTS engineers are available to assist you. If you have an emergency after business hours, please leave a message with the Answering Service and a technician will return your call as soon as possible.

DTS Headquarters

5171 Clareton Drive
Agoura Hills, CA 91301

Email: proaudioinfo@dtsonline.com
Phone: +1 (818) 706.3525 or in USA +1 (800) 959.4109
Fax: +1 (818) 706.1868
Customer Service Fax: +1 (818) 879.2746

DTS Europe

Email: dtsinfo@dtsonline.co.uk
Phone: +44 (0) 1189.349.199
Fax: +44 (0) 1189.349.198

DTS Japan

Email: atsuko@dtstech.co.jp
Phone: +81 (0) 3.5794.5288
Fax: +81 (0) 3. 5794. 5266

Visit our web site http://www.dtsonline.com/pro-audio/ for the latest DTS news on Pro Audio products.

Returning Units for Service

Before sending any item back to DTS for warranty, repair, exchange or replacement parts, please call DTS Customer Service (see above) to provide the serial number of the equipment to be returned and to obtain a **Return Authorization** number. No replacement units will be sent and no shipments will be accepted without a Return Authorization number.

Alternatively, you can send email to DTS Customer Service at customerservice@dtsonline.com

Ship returns (clearly marked with the Return Authorization number on the outside of the package) to the Service Center for your region.

1. Introduction

This manual describes the configuration and operation of the DTS CAD-5 Decoder. The decoder can decode all current embodiments of the DTS Coherent Acoustic algorithms and will also decode Neo:6.

1.1. Front Panel Controls and Indicators

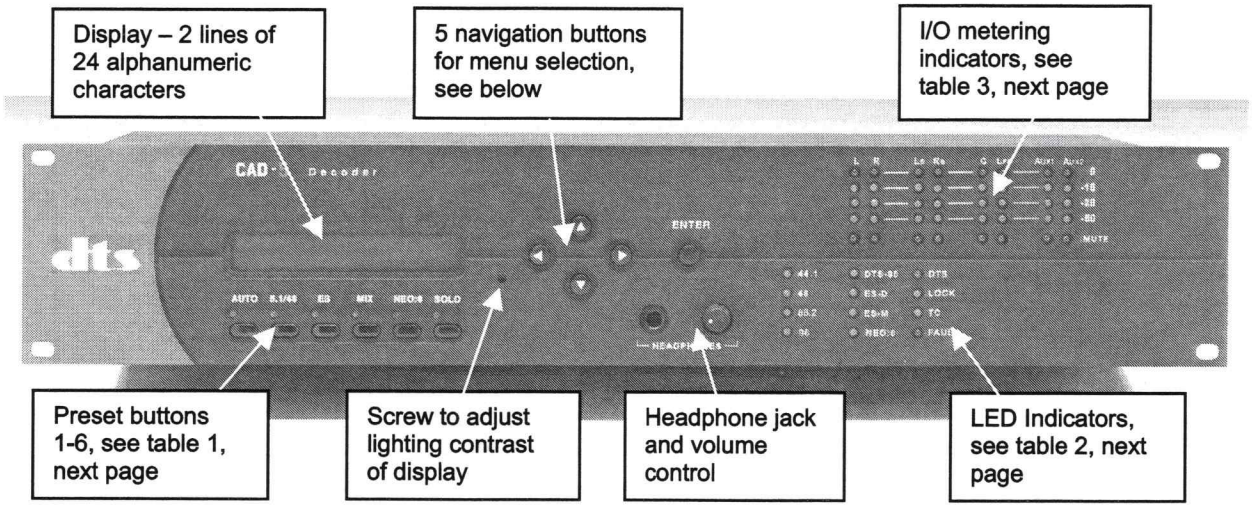
Display – 2 lines of 24 alphanumeric characters
5 navigation buttons for menu selection, see below
I/O metering indicators, see table 3, next page
Preset buttons 1-6, see table 1, next page
Screw to adjust lighting contrast of display
Headphone jack and volume control
LED Indicators, see table 2, next page
ENTER

Figure 1. CAD-5 Front Panel

1.1.1. Navigation

The Up, Down, Left and Right arrow buttons and the ENTER button are used to navigate the menus. (See *CAD-5 Menus* on page 7.)

◀ **Left** arrow button takes you back (up) a level.

▶ **Right** opens a deeper level of menu.

▲ ▼ **Up/Down** buttons will increase/decrease the parameter values or scroll the available parameters or scroll the menu tree through Status Display, Decode Parameters and System Setup.

ENTER will either open a deeper level of menu, or will store the parameter change you have made.

Table 1. Pushbuttons

☑ **Note**: The unit does not automatically detect the sampling frequency of incoming PCM streams. You must manually set the sampling frequency using the menus (System Setup → PCM Sampling Frequency).

Preset Buttons 1-6 with LED Indicator		
1	Auto	Plays the input bitstream (whether it is DTS bitstream or PCM audio.).
2	5.1 Core	When the incoming bitstream is either ES or 96K, plays the 48 kHz 5.1 core of the input to the CAD-5
3	ES	This button is only functional when there is a 6.1 ES Discrete bitstream present. When you press the ES button, a 5.1 ES matrix mix will occur. If there is any bitstream other than 6.1 ES Discrete, the button is non functional. When the bitstream is not 6.1 a warning will appear in the display: "6.1 bitstream not present. ES button inactive".
4	Mix	Enables / disables the downmix value that was selected in the Downmix menu (Lt/Rt or Lo/Ro). The Status display will show the current selection.

If Mix is enabled with:	You hear:
Auto	2-ch mixdown of the incoming bitstream
5.1 Core	2-ch mixdown of the 5.1 core component of the input
ES	downmix mode of the matrixed ES signal

5	Neo:6	Enables / disables Neo:6. It turns on Neo:6 function and will turn on the mode and parameters that have been selected in the menu. See topic *Neo:6 Button*, next page.
6	Solo	Turns solo mode ON/OFF. See topic *Solo Button*, next page.

☑ **Note**: Up to three buttons can be active at the same time: 1 or 2 or 3 AND 4 AND 6. For example, you could be listening to the downmix of the 5.1 core and you might need to activate Solo in order to listen to channels individually.

Table 2. Input Signal Indicators

These indicators show the type of input signal (prior to processing).

LED	Color	Indicator
44.1	Yellow	44.1 kbps sampling rate
48	Yellow	48 kbps sampling rate
88.2	Yellow	88.2 kbps sampling rate
96	Yellow	96 kbps sampling rate
DTS-96	Yellow	96/24 DTS Decoding
ES-D	Yellow	ES-Discrete Decoding
ES-M	Yellow	ES-Matrix Decoding
NEO:6	Yellow	ON when lighted (See topic *Neo:6*, page 14.)
DTS	Blue	Indicates presence of a DTS decoded output
LOCK	Yellow	PLL is locked (input clocks are locked to output clocks)
TC	Yellow	Timecode present in Bitstream
FAULT	Red	Bitstream problem; decoding fault

Table 3. I/O Metering LED Indicators

For each channel (L, R, LS, RS, C, LFE, Aux1 and Aux2) there are five LEDs that indicate digital output level. Analog output is not displayed. (See the related topic *Meter Ballistics*, page 11.)

Position (color)	Meaning
Top (red)	0 dBFS
Second (yellow)	–10 dBFS
Third (green)	–20 dBFS
Fourth (green)	–50 dBFS
Bottom (red)	MUTE

1.1.2. Solo Button

When Solo is enabled, the up and down arrows ▲▼ will scroll through the eight channels in order. The display will show the selected channel. All other channels will be muted and the Mute indicators will be lighted for the other channels. The Solo button works with both analog and digital output.

```
Main and Headphone Solo
Active Solo = Left Surr
```

1.1.3. Neo:6 Button

The Neo:6 button turns Neo:6 mode on/off. Use the Neo:6 menus to specify the output (see *Neo:6 Menu Parameters* on page 14 for details). You must specify the analog or digital input source using the System Setup → Input Select menu. See also *Neo:6 Expanding Stereo into 6.* on page 5 for a functional description of Neo:6.

1.1.4. Lock / Unlock the Front Panel

To lock the front panel controls, go to the **Front Panel Lock** menu (under System Setup) and press ENTER. To unlock it, press the Up arrow, then the Right arrow, then ENTER, in that sequence.

1.2. Rear Panel Connectors

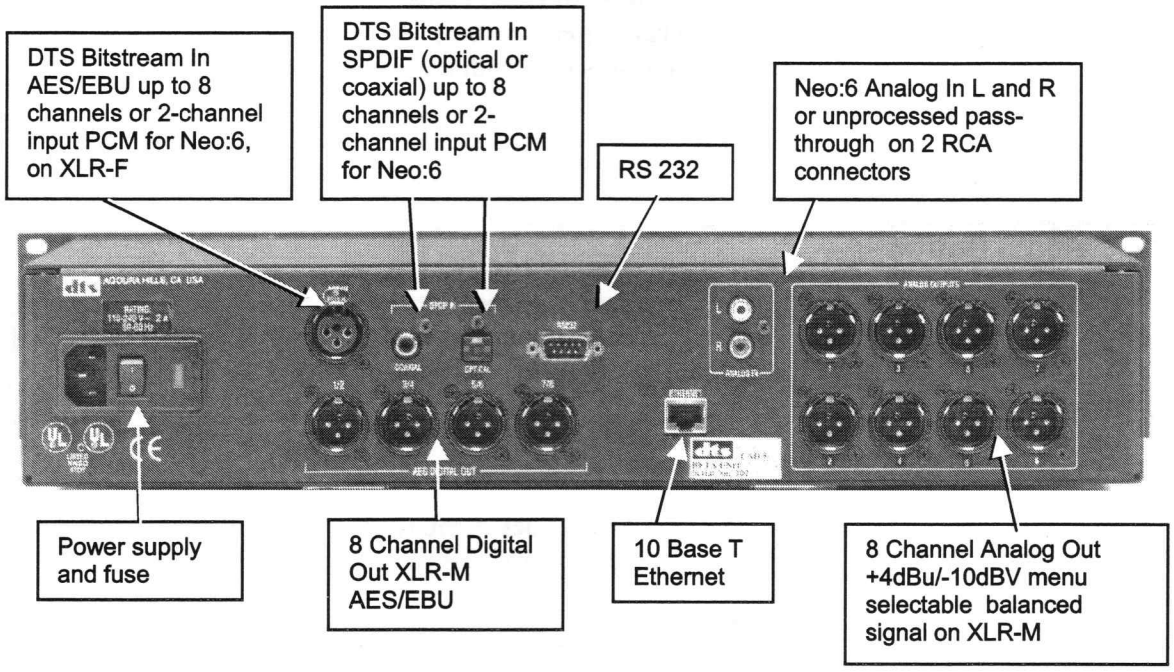
DTS Bitstream In AES/EBU up to 8 channels or 2-channel input PCM for Neo:6, on XLR-F
DTS Bitstream In SPDIF (optical or coaxial) up to 8 channels or 2-channel input PCM for Neo:6
RS 232
Neo:6 Analog In L and R or unprocessed pass-through on 2 RCA connectors
Power supply and fuse
8 Channel Digital Out XLR-M AES/EBU
10 Base T Ethernet
8 Channel Analog Out +4dBu/-10dBV menu selectable balanced signal on XLR-M

Figure 2. CAD-5 Rear Panel

Mains Power with Power On/Off Switch – Auto-sensing 100-240VAC 50-60 Hz, 80 watts maximum. The fuse is 2 Amp, slo-blo, 5x20 mm.

Digital Inputs – There is a choice of three inputs available, AES/EBU, SPDIF Coaxial (RCA 75 Ohm), or SPDIF Optical (Toslink).

Analog Inputs – Analog L and R on RCA.

Digital Outputs – The four AES/EBU outputs are paired as: Left/Right, Left Surround/Right Surround, Center/LFE, and Aux1/Aux2.

Analog Outputs – All analog outputs are balanced XLR. +4dBu is the professional level; -10dBV is the consumer level.

Table 4. Channel assignments, analog outputs

Channel Number	Coherent Acoustics
1	Left
2	Right
3	Left Surr
4	Right Surr
5	Center
6	Sub (LFE)
7	AUX1 (ES Mode)
8	AUX 2 (second ES channel)

1.3. Functional Overview

The DTS CAD-5 Decoder can decode all current embodiments of the DTS Coherent Acoustic algorithms (see

Specifications beginning on page 19). The decoder can also decode Neo:6.

☑ **Note**: The CAD-5 Decoder will drop-out when corrupted frames within a bitstream are encountered. It will not mask a corrupted frame within a bitstream. It will drop-out that frame, and The FAULT indicator will light on the front panel. (To clear the fault indicator, see page 7, Status 4.)

1.3.1. Neo:6 Expanding Stereo into 6.0

DTS Neo:6 provides up to six full-band channels of matrix decoding from stereo material. The input of the Neo:6 can be analog or digital. The parameter is located under "Input Select" under the System Setup menu. Neo:6 can synthesize the stereo mix into 3, 4, 5 or 6 channels. Select the desired number of channels from the "Channel Selection" parameter under the Decode Parameters → Neo:6 menu.

- **Stereo matrix to 5.0 or 6.0:** Neo:6 provides up to six full-band channels of matrix decoding from stereo matrix material. Users with 5.0 and 6.0 systems can derive five and six separate channels, respectively, corresponding to the standard home theater speaker layouts.
- **Extended Surround:** Neo:6 provides optimum decoding of Extended Surround matrix soundtracks, and can also generate a back channel from 5.1 material.
- **Natural sound field with precise localization:** Neo:6 technology allows various sound elements within a channel or channels to be steered separately and follow naturally from the original presentation.
- **Extended music mode**: Neo:6 offers a music mode that expands stereo non-matrix recordings into the five- or six-channel layout without diminishing the subtlety and integrity of the original stereo recording.

The figure at right shows the flow of data for the transformation of stereo signal into 6.0 audio via Neo:6 technology.

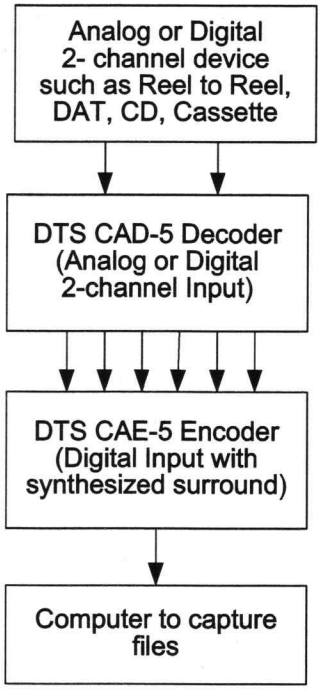
Analog or Digital 2- channel device such as Reel to Reel, DAT, CD, Cassette
DTS CAD-5 Decoder (Analog or Digital 2-channel Input)
DTS CAE-5 Encoder (Digital Input with synthesized surround)
Computer to capture files

Figure 3. Neo:6 expands stereo into 6.0

1.4. Inputs

Coded Coherent Acoustic Bitstream and PCM Audio

- AES/EBU XLR-F
- SPDIF 75 Ohm RCA
- SPDIF Toslink Optical

Analog L and R input on RCA

- For Neo:6 input and unprocessed pass-through (which is active when the Neo:6 is not active, resulting in plain stereo)

1.5. Outputs

- Analog, 8 channels, balanced, +4 dBu or –10 dBV XLR-M connectors
- Digital 8 channels AES/EBU XLR-M connectors
- Headphone output – options are L/R, LS/RS, LCR, LO & RO. Single channels are only offered when using the Solo button on front panel.
  32 ohm impedance, max output is 20 mW output at -20 dBFS[1].

1.6. Control

- RS-232 Serial Control IN (reserved for future use)
- 10-baseT Ethernet option to enable full remote control of operations (reserved for future use)

1.7. Additional Features

- Invalid Input Circuit – This circuit will detect a digital stream that is neither DTS nor PCM, and the DSP will mute both digital and analog outputs for such invalid types.
- Calibration output – for calibration of external equipment (see Test Tones, page 11)
- Analog Trim Controls-Analog output has digital 0 to –8 dB (in 1 dB steps) and OFF (MUTE) step increments, this will be accessible from the menu.
- Headphone Volume on Front Panel.
- Channel Layout for Test Tones

[1] decibel full scale

2. CAD-5 Menus

2.1. Status Display

The LCD screen is a two-line display with 24 alphanumeric characters. The additional two-lines of display are accessible by using the up and down arrows. When not in menu mode, the following status display is visible. After 7 seconds in any menu with no activity, the display reverts to this status display.

Status 1: Reflects box input stream type.

```
IN: DTS 6.0 ES-M   24bit
48kHz            1509kbps
```

Press the down arrow ▼ to view the next screen.

Status 2: Reflects box output stream type.

```
OUT: DTS 5.1 CORE  24bit
48kHz            1509kbps
```

Press ▼ to view the next screen.

Status 3: You can clear any peak hold setting by pressing ENTER at this screen.

```
Clear Peak Hold
<PRESS ENTER>
```

Press ▼ to view the next screen.

Status 4: You can clear any fault indicator by pressing ENTER at this screen.

```
Clear Fault LED
<PRESS ENTER>
```

Press ▼ to view the next screen.

Status 5: Reflects downmix and timecode type and position, if available.

```
Downmix: Off
Unknown   00:00:00:00
```

Press ▼ to view the next screen.

Status 6: Neo:6 settings.

```
Neo:6 mode:          Wide
Channels:            Six
```

Press ▼ to return to the first screen.

The top-level menu structure is shown in Figure 4. Press the up/down arrow buttons to move between the branches.

2.2. Top Level Menu Structure

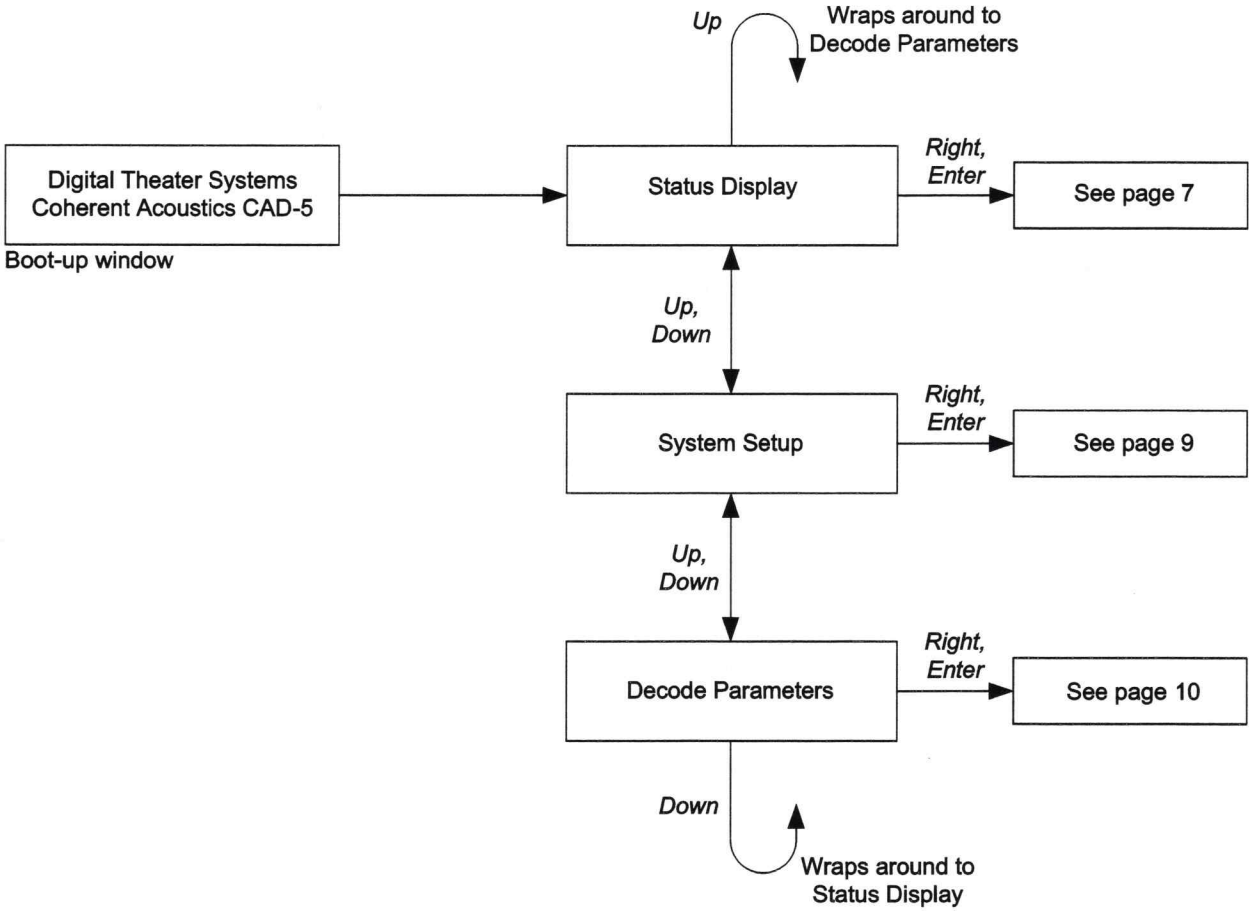

Figure 4. Top-level menu structure

2.3. System Setup Menus

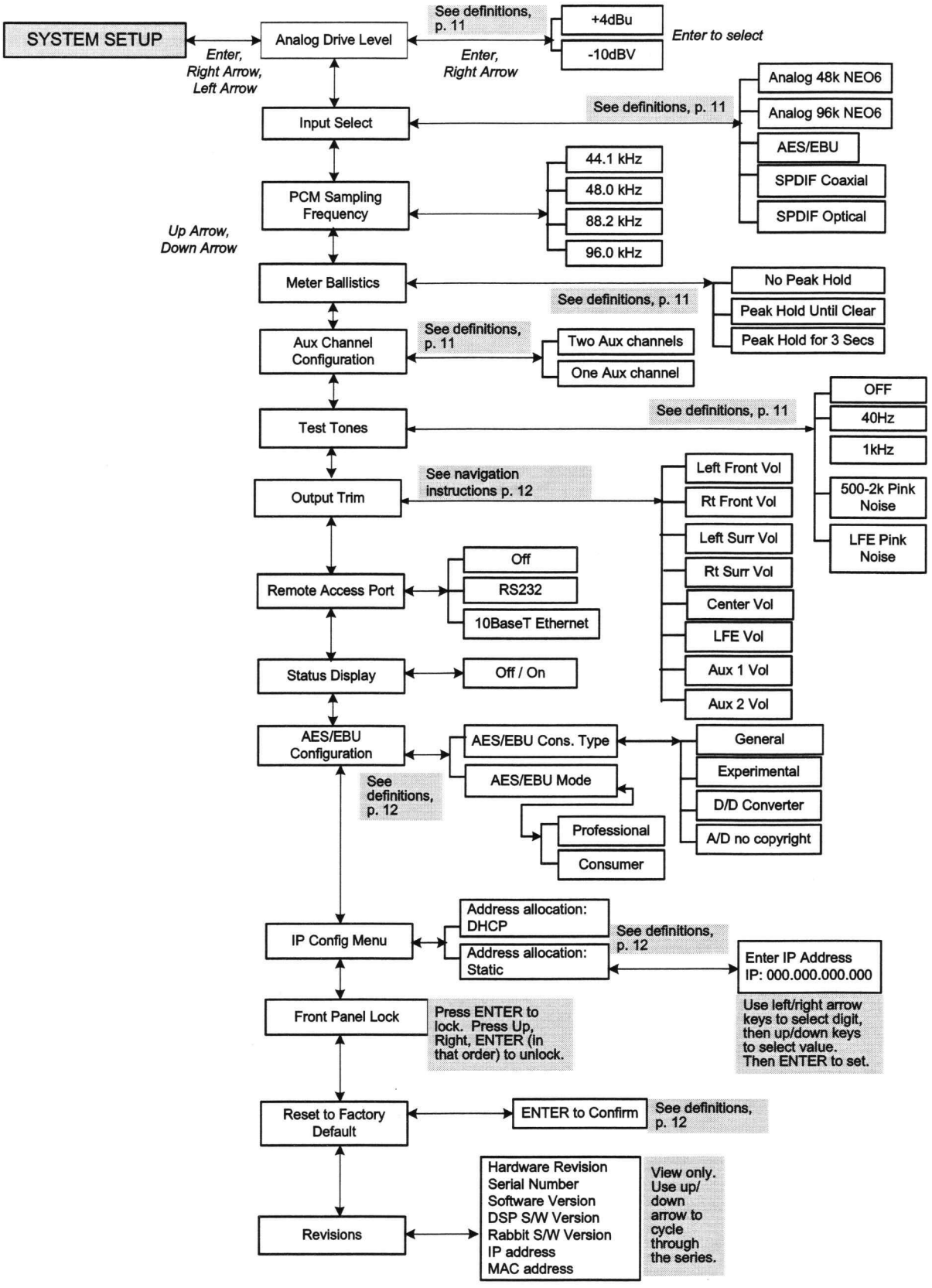

Figure 5. System Setup menu tree

2.4. Decode Parameters Menus

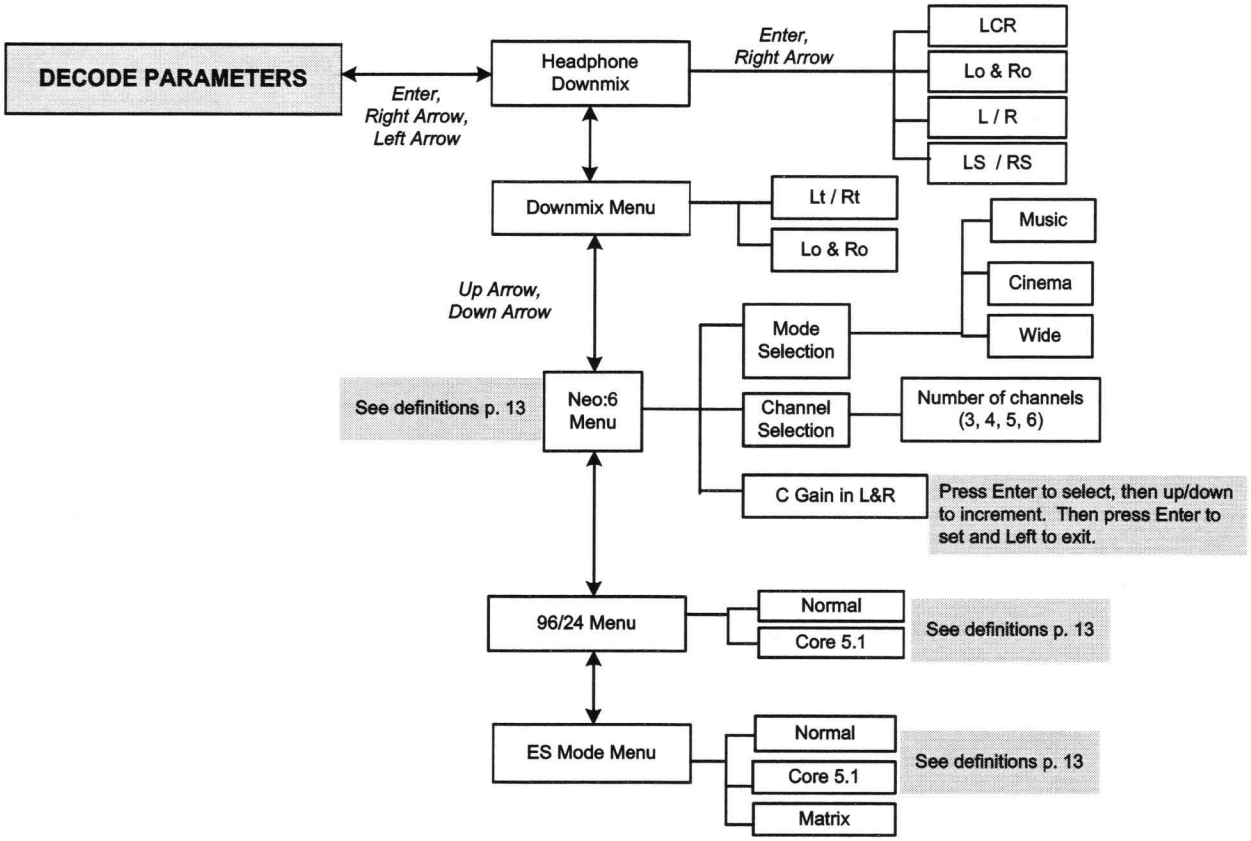

Figure 6. Decode Parameters menu tree

2.5. Parameters and Definitions

2.5.1. Analog Drive Level

By setting the Analog Drive Level to +4 dBu (professional), the unit will output +4 dBu analog output. Select –10 dBV (consumer) to produce –10 dBV analog output.

Figure 7 shows the interconnectivity between balanced and unbalanced wiring.

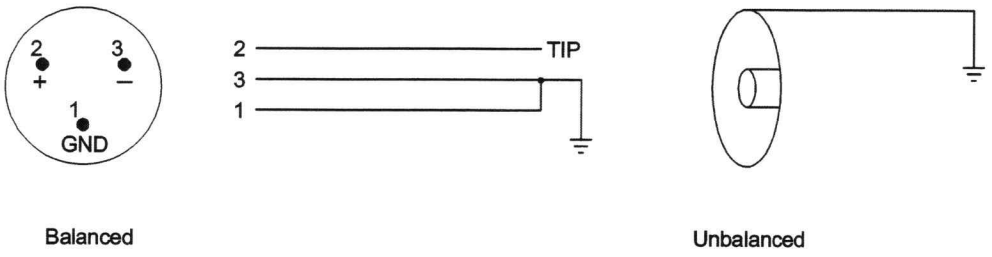

Figure 7. Wiring for balanced output to unbalanced input

2.5.2. Input Select

The Input Select menu is used for selecting analog or digital inputs to the CAD-5. Analog inputs are only used for Neo:6, or is unprocessed pass-through when Neo:6 is inactive. Digital inputs can be used for DTS bitstreams or PCM stereo audio.

- Analog 48 kHz Neo:6
- Analog 96 kHz Neo:6
- AES/EBU (XLR-F)
- SPDIF Coaxial
- SPDIF Optical

2.5.3. Meter Ballistics

This menu sets the characteristics of the LED level display operation. The settings are:

- Peak Hold Until Clear
- Peak Hold For 3 Sec
- No Peak Hold

Peak hold until clear will hold the peak level indefinitely. The peak hold can be cleared manually by using the Clear Peak Hold menu under the Status main menu. Peak hold for 3 seconds will hold the peak level for 3 seconds. No peak hold displays the instantaneous values on the level meters only.

2.5.4. Aux Channel Configuration

Choose one or two aux channels. Choose "one" when one center rear channel is present; choose "two" when two center rear channels are present. The gain will be reduced by 3 dB.

2.5.5. Test Tones

Table 5. Test Tone Settings

Test Tone Setting	Description
Off	All channels
40 Hz Test Tone	LFE only; L, C, R, Ls, Rs, Aux1 and Aux2 are off
1 kHz Test Tone	All channels L, C, R, Ls, Rs, Aux1 and Aux2 are on – LFE is off
500 -2k Pink Noise	All channels are on L, C, R, Ls, Rs, Aux1 and Aux2 except LFE – LFE is off
LFE Pink Noise	20-80 Hz LFE only is on – L, C, R, Ls, Rs, Aux1 and Aux2 are off

The levels should all be the same for the L, C, R, Ls, Rs, Aux1, Aux2 and Subwoofer.

Test Tones should be –20 dBFS.

Pink Noise should be –20 dBFS average.

2.5.6. Output Trim Navigation

From the System Setup | Output Trim screen, press ENTER to select a channel in VIEW mode.

```
OUTPUT TRIM:       VIEW
Left Front Vol:    00dB
```

Use the ▲▼ up/down arrows to scroll through the channels. Press ENTER to switch to EDIT mode.

```
OUTPUT TRIM:       EDIT
Left Front Vol:   -02dB
```

Press ▲▼ up/down arrow to select from Mute, -00dB to -8dB, then ENTER to set and return to VIEW mode.

Press ◄ left arrow to move back (upward) one level to go back to view the channel.

Press ▲▼ up/down arrow to select another channel for viewing or editing.

If you are done trimming the outputs of all the channels press ◄ left two times to exit to the System Setup menu.

2.5.7. AES/EBU Configuration

Select **Mode** – Professional or Consumer. This sets a flag in the audio header on the digital outputs from the decoder, stating either "Professional" or "Consumer".

Select **Consumer Output Type** – This sets a flag in the audio header on the digital outputs from the decoder; nothing is physically changed in the audio. Choose General, Experimental, D/D Converter, or A/D No Copyright.

2.5.8. IP Configuration Menu

Static – Manually enter the IP address.

DHCP – Dynamic Host Configuration Protocol, a dynamic IP address assignment.

The **Enter IP** menu is accessible only after selecting **Static** in the address allocation.

2.5.9. Reset to Factory Defaults

These are the factory preset defaults:

SYSTEM SETUP

Analog Drive Level: +4 dBu
Input Select: AES/EBU
PCM Sampling Frequency: 48 kHz
Test Tones: Off
Output Trim: 0dB (all channels)
Status Display: On

IP Config Menu: Address Allocation – DHCP

IP Address: will be obtained from the DHCP or the Ethernet module will allocate this

DECODER PARAMETERS

Headphone Downmix: L/R

Downmix Menu: Lt/Rt

Neo:6 Menu: Mode Selection – Wide
Channel Selection – 6 channels
C Gain in L&R: 0.3

96/24 Menu: Normal (decoding the incoming bit stream)

ES Mode Menu: Normal (decoding the incoming bit stream)

2.5.10. Neo:6 Menu Parameters

In Neo:6 mode the number of channels available will be determined by the parameter "Channel Selection". You must specify the analog or digital input source using the System Setup → Input Select menu. The output of the Neo:6 is 3, 4, 5, or 6 channels of audio outputs, both analog and digital, that has been unwrapped from a 2-channel source and spread out and synthesized to a surround mix.

Mode Selection:

- Cinema – for Left/Right encode material (Lt/Rt Matrix)
- Wide – widens the center image across L C R
- Music – surround music mode for 2 channel audio

C Gain – (Center Gain) in Music mode this defines the amount of center material present in L and R. It varies between 0 and 100%.

Channel Selection – (stereo unwrap options) select 3, 4, 5, or 6 channels. Neo:6 takes a stereo signal and synthesizes it into a surround mix.

2.5.11. 96/24 Mode

Normal – Normal plays 96/24 from the incoming bitstream.

Core 5.1 –Plays the 5.1 48 kHz component of the 96/24 bitstream.

2.5.12. ES Mode

Normal – Normal plays a 6.1 ES discrete mix from the incoming bitstream.

Core 5.1 –Plays only the 5.1 48 kHz component of the 6.1 bitstream.

Matrix – This is the same as the ES button on the front panel. If there is a 6.1 ES Discrete bitstream being decoded; the button will let you monitor the mix as a 5.1 ES Matrix mix.

3. Sample Production Setup

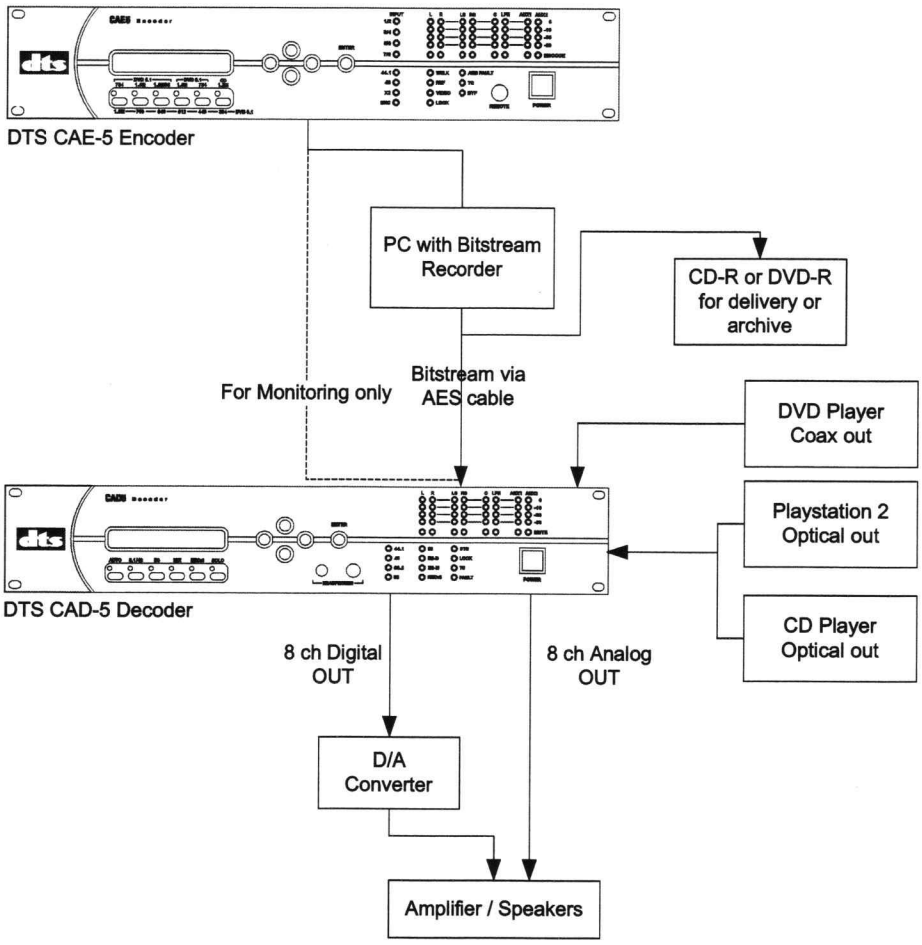

Figure 8. Typical Production Setup

☑ **Note:** To play PCM Audio, the correct sample rate must be set. The unit does not automatically detect the sampling frequency of incoming PCM streams. You must manually set the sampling frequency using the menus (System Setup → PCM Sampling Frequency).

3.1. PCM Setup

You can listen to the decoded DTS bitstream on one digital input and the PCM audio on another input. Simply select the input you wish to monitor. The CAD-5 will retain all settings while the unit is turned off.

Go to the **System Setup** menu and set up these parameters:

1. Input Select: Set the input to AES/EBU, SPDIF Coaxial or SPDIF Optical, or analog (for PCM).
2. PCM Sampling Frequency: Set the parameter to the correct sampling rate. The choices are: 44.1 kHz, 48 kHz, 88.2 kHz or 96 kHz.

4. Maintenance

Power module fuse replacement:

⚠ **Caution**: For continued protection against risk of fire, replace only with same type and rating of fuse.

DTS part number	Description	Manufacturer
2800002004	Fuse, 2 Amp, slo blo, 5x20 mm	Littelfuse (218 002)

5. Specifications

☑ DTS CAD-5 Decoder specifications subject to change without notice.

Sync Sources

Internally derived word clock from SPDIF/Toslink or AES/EBU at 44k1/48k/88k2/96k

Algorithms

DTS 1.0 to DTS 6.1, DTS-96/24™, DTS-ES™

5.1. Inputs

Analog

2 RCA connectors, unbalanced, -10 dBV nominal

Analog input at 96 or 48 kHz
10 kohm impedance:

Digital

AES/EBU: XLR-F, 110 ohm impedance

SPDIF Coaxial (RCA), 75 ohm impedance

SPDIF Optical (TOSLINK)

5.2. Outputs

Analog 8-channel

XLR-M (pin 2 hot)

Drive Level: +4 dBu, Max output level +24dBu (+4dBu @ 0dBFS) or -10 dBV,
24-bit DAC
50 ohm output impedance

Drive Level: -10 dBV or +4 dBu

Frequency Response: All channels except LFE, 20 Hz to 20 kHz +/- .3dB

LFE bandwidth limited to: 20 Hz to 80 Hz

Dynamic Range: 113 dB (IEC-A weighted)

Signal to Noise: 110 dB (20-20k unweighted)

Crosstalk: < 80 dB at 1 kHz

Distortion: < 0.006% 20 Hz to 20 kHz @ 0 dBFS

4. Maintenance

Power module fuse replacement:

⚠ **Caution**: For continued protection against risk of fire, replace only with same type and rating of fuse.

DTS part number	Description	Manufacturer
2800002004	Fuse, 2 Amp, slo blo, 5x20 mm	Littelfuse (218 002)

5. Specifications

☑ DTS CAD-5 Decoder specifications subject to change without notice.

Sync Sources

Internally derived word clock from SPDIF/Toslink or AES/EBU at 44k1/48k/88k2/96k

Algorithms

DTS 1.0 to DTS 6.1, DTS-96/24™, DTS-ES™

5.1. Inputs

Analog

2 RCA connectors, unbalanced, -10 dBV nominal

Analog input at 96 or 48 kHz
10 kohm impedance:

Digital

AES/EBU: XLR-F, 110 ohm impedance

SPDIF Coaxial (RCA), 75 ohm impedance

SPDIF Optical (TOSLINK)

5.2. Outputs

Analog 8-channel

XLR-M (pin 2 hot)

Drive Level: +4 dBu, Max output level +24dBu (+4dBu @ 0dBFS) or -10 dBV,
24-bit DAC
50 ohm output impedance

Drive Level: -10 dBV or +4 dBu

Frequency Response: All channels except LFE, 20 Hz to 20 kHz +/- .3dB

LFE bandwidth limited to: 20 Hz to 80 Hz

Dynamic Range: 113 dB (IEC-A weighted)

Signal to Noise: 110 dB (20-20k unweighted)

Crosstalk: < 80 dB at 1 kHz

Distortion: < 0.006% 20 Hz to 20 kHz @ 0 dBFS

Table 6. Analog Output Channel Assignments

Channel Number	Coherent Acoustics
1	Left
2	Right
3	Left Surr
4	Right Surr
5	Center
6	Sub (LFE)
7	AUX 1(ES Mode)
8	AUX 2 (second ES channel)

Digital 8-channel

Connector: four XLR-M; AES/EBU outputs are paired as Left/Right, Left Surround/Right Surround, Center/LFE, and Aux1/Aux2.

Signal type: Electrical Format: AES/EBU (AES3-1992)

Coding Format: AES/EBU Professional

Sample Rates: 44.1, 48, 88.2, 96 kHz

Bit Depth: 16, 20, or 24 bits

Termination: 110 ohm

Test Tones

Analog Output Reference Level: maximum +22dB

Band limited pink noise and test tones

Headphones

Connector: Headphone jack stereo with level control

Signal type: 32-ohm impedance, max 20 mW output at -20 dBFS.

Downmix Modes : Stereo, Lo/Ro, Lt/Rt, Mono

5.3. Comm I/O

(currently not used)

RS-232 Serial I/O Connector: DB9-F

8 data bits No parity 1 stop bit 115200 baud DCE, no flow control.

Ethernet Port: 10 Base-T, RJ-45 female connector

5.4. Metering

Channel level LED meters 0dB to -50dB

Channel MUTE indicator

5.5. Front Display

2-line LCD with menus for selection and display of decoding information

5 navigation buttons

6 control pre-set buttons

5.6. Power and Dimensions

Power Requirements: 80-264V at 50-60 Hz auto-sensing, 80W maximum, rear mains power switch.

Dimensions: 2-U rack-mount width: 48.3 cm (19 inch), height: 8.9 cm (3.50 inch); depth: 27.3 cm (10.75 inches)

Weight: 3.3kg (7.25 lb)

Shipping Weight: 7.8kg (17.25 lb)

Combined (Package A) Shipping Weight: 11kg (24.5 lb)

Shipping Dimensions (Separate or Package A): 622.3mm (24.5 inches) Wide x 419.1mm (16.5 inches) Deep x 254 mm (10 inches) High

5.7. Environmental

0 deg to 45 deg C (32 deg to 114 deg F) – Operating

5.8. Regulatory Compliance

Europe Directives: Low Voltage - 73/23/EEC, EMC - 89/336/EEC

CE Mark

North America: UL and cUL listed

FCC Class A digital device

5.9. Channel Mapping

Table 7. Coherent Acoustic Options: Channel Mapping

AMODE	AES I/O Channel	1L 1	1R 2	2L 3	2R 4	3L 5	3R 6	4L 7	4R 8
0	1.0, Mono	Mono	Mono	-	-	-	LFE	-	-
1	2.0, Dual Mono	M1	M2	-	-	-	LFE	-	-
2*	2.0, Lo/Ro	L	R	-	-	-	LFE	-	-
3	2.0, Sum/Diff	L+R	L-R	-	-	-	LFE	-	-
4	2.0, Lt/Rt	Lt	Rt	-	-	-	LFE	-	-
5	3.X, L/C/R	L	R			C	LFE	-	-
6	3.X, L/R/Mono Surround	L	R	Mono Sur	Mono Sur	-	LFE	-	-
7	4.X, L/C/R/Mono Surround	L	R	Mono Sur	Mono Sur	C	LFE	-	-
8	4.X, L/R/Stereo Surround	L	R	L Sur	R Sur	-	LFE	-	-
9**	5.X, L/C/R/Stereo Surround	L	R	L Sur	R Sur	C	LFE	-	-
9***	6.X, L/C/R/Stereo Surround/Mono Rear Matrix	L	R	L Sur	R Sur	C	LFE	Mono Rear	Note 1
9****	6.X, L/C/R/Stereo Surround/Mono Rear Discrete	L	R	L Sur	R Sur	C	LFE	Mono Rear	Note 1

AMODE = code representing audio channel arrangement that describes the number of audio channels and the audio playback arrangement. For example, AMODE 9 would be 5.1 L/C/R Stereo Surround.

LFE – If LFE is enabled, the format is expressed as n.1 and Channel 6 contains the LFE. If LFE is not enabled, the format is expressed as n.0 and Channel 6 contains no audio.

* DTS Lo/Ro

** DTS 5.1

*** DTS ES

**** DTS 6.0 (ES Discrete)

Note 1. Channel 8 will allow a second rear center speaker to be used. There will be a 3 dB drop in level for the two rear speakers.

Table 8. Bit Rates

☑ Note: The bit rates and frame sizes are read-only (not user selectable) in the Decoder.

DTS Broadcast bit rates		Options Available (depending on the input files) AMODE	LFE	ES (Matrix)	XMODE 6.0 (ES discrete Xmode flag)	Sample Freq. [kHz]	Frame Size	Latency [ms]
Bit Rate [kbps]	128	0	YES	NO	NO	48	2048	48
	160	0	YES	NO	NO	48	1024	26.67
	192	0	YES	NO	NO	48	1024	26.67
		2	YES	NO	NO		1024	26.67
	224	0	YES	NO	NO	48	1024	26.67
		2	YES	NO	NO		1024	26.67
	256	0	YES	NO	NO	48	1024	26.67
		2	YES	NO	NO		1024	26.67
	320	0	YES	NO	NO	48	1024	26.67
		1-4	YES	NO	NO		2048	48
	384	0-4	YES	NO	NO	48	1024	26.67
		5-9	YES	YES	NO		2048	48
	448	0-4	YES	NO	NO	48	1024	26.67
		5-9	YES	YES	NO		2048	48
	512	0-4	YES	NO	NO	48	1024	26.67
		5-9	YES	YES	NO		2048	48
	576	0-4	YES	NO	NO	48	512	16
		5-9	YES	YES	NO		2048	48

DTS Broadcast bit rates		Options Available (depending on the input files)						
		AMODE	LFE	ES (Matrix)	XMODE 6.0 (ES discrete Xmode flag)	Sample Freq. [kHz]	Frame Size	Latency [ms]
	640	0-4 5-9	YES YES	NO YES	NO NO	48	512 2048	16 48
	768	0-4 5-9	YES YES	NO YES	NO YES*	48/88.2/96 48	512 1024	16 26.67
	960	0-4 5-9	YES YES	N/A YES	NO YES*	48/88.2/96 48	512 1024	16 26.67
	1024	0-4 5-9	YES YES	N/A YES	NO YES*	48/88.2/96 48	512 1024	16 26.67
	1152	0-4 5-9	YES YES	N/A YES	NO YES*	48/88.2/96 48	512 1024	16 26.67
	1280	0-4 5-9	YES YES	N/A YES	NO YES*	48/88.2/96 48	512 1024	16 26.67
	1344	0-4 5-9	YES YES	N/A YES	NO YES*	48/88.2/96 48	512 1024	16 26.67
	1408	0-4 5-9	YES YES	N/A YES	NO YES*	48/88.2/96	512	16
	1411.2	0-4 5-9	YES YES	NO YES	NO YES*	48/88.2/96	512	16
	1472	0-4 5-9	YES YES	N/A YES	NO YES*	48/88.2/96	512	16
	1536	0-4 5-9	YES YES	NO YES	NO YES*	48/88.2/96	512	16

DTS DVD Video bit rates		Options Available (depending on the input files)						
		AMODE	LFE	ES (Matrix)	XMODE 6.0 (ES discrete Xmode flag)	Sample Freq. [kHz]	Frame Size	Latency [ms]
Bit Rate [kbps]	754	0-4 5-6 7-8 9	YES YES YES YES	NO NO NO YES	NO NO NO YES*	48-96 48 48 48	512	16
	1509	0-4 5-9 9	YES YES YES	NO YES YES	NO NO YES*	48/96 48/96 48	512	16

DTS CD bit rate	Options Available (depending on the input files)					
	AMODE	LFE	ES (Matrix)	XMODE 6.0 (ES discrete Xmode flag)	Sample Freq. [kHz]	Frame Size
1235 kbps	0-4 5-9 9	YES YES YES	NO YES YES	NO NO YES*	44.1-88.2 44.1 44.1	1024

* DTS 6.0 always also sets ES. That is, DTS ES is always available in bitstreams encoded for DTS ES Discrete

WARRANTY

Equipment manufactured by Digital Theater Systems, Inc. is warranted against defects in materials and workmanship for one year from the date of purchase. There are no other express or implied warranties. Digital Theater Systems, Inc.'s obligation is restricted to repair and replacement of defective parts. Under no circumstances will Digital Theater Systems, Inc. be liable for any other damage, either direct or consequential.

NOTE

Warranty void unless the following Factory Warranty Information is provided to DTS within thirty (30) days of purchase.

FACTORY WARRANTY INFORMATION

Complete this form for **each** DTS Encoder or Decoder installation

COMPANY: _____

LOCATION: _____

_____

_____

COUNTRY:

CONTACT: Name: _____

Telephone: _____

E mail _____

TECHNICAL CONTACT: Name: _____

Telephone: _____

E mail:_____

DTS SERIAL #: _____

Date of Purchase _____

The information below will help in DTS knowing how you integrate the encoder and use it.

DVD Workstation TYPE:: _____

Type of Computer ❒ PC ❒ Mac O/S_____

Soundcard _____

Usual Encode Bit Rate ❒ 754kbps ❒ 1.5Mbps

Typical Channel Layout ❒ 5.1 ❒ 6.1

Sample Rate ❒ 48kHz ❒ 96kHz

Do you synthesize surround from a 2 channel source ❒ yes ❒ no

Return completed form via Fax to: +1 (818) 879-2476; Attn: Customer Service, or via postal mail to: DTS Customer Service – 5171 Clareton Drive – Agoura Hills, CA 91301 – USA

Corporate Headquarters

DTS, Inc.
5171 Clareton Drive
Agoura Hills, CA 91301
USA
Phone: 818.706.3525
Fax: 818.706.1868
www.dtsonline.com

International Offices

DTS Europe
5 Tavistock Estate
Ruscombe Lane
Twyford, Berkshire RG109NJ
UK
Phone: +44 (0) 1189.349.199
Fax: +44 (0) 1189.349.198
www.dtsonline.co.uk

DTS Japan
Liaison Office
AT Communications K.K.
2-14-4 Shinonome, Koto-ku
Tokyo 135-0062
Japan
Phone: 81 (0) 3.5564.7156
Fax: 81 (0) 3.3520.1022
www.dtsTech.co.jp

DTS China
1308, Citic Plaza
233 TianHeBei Road
Guangzhou 510620
China
Phone: +86 (0) 20.3877.3833
Fax: +86 (0) 20.8752.0845
www.dtschina@dtsonline.com